77/31

A.D. 1862. Oct. 13. № 2751.
G. & A. HARVEY'S Specification.

408/8

4/77/63 ox

(1 Sheet.)

FIG. 1.

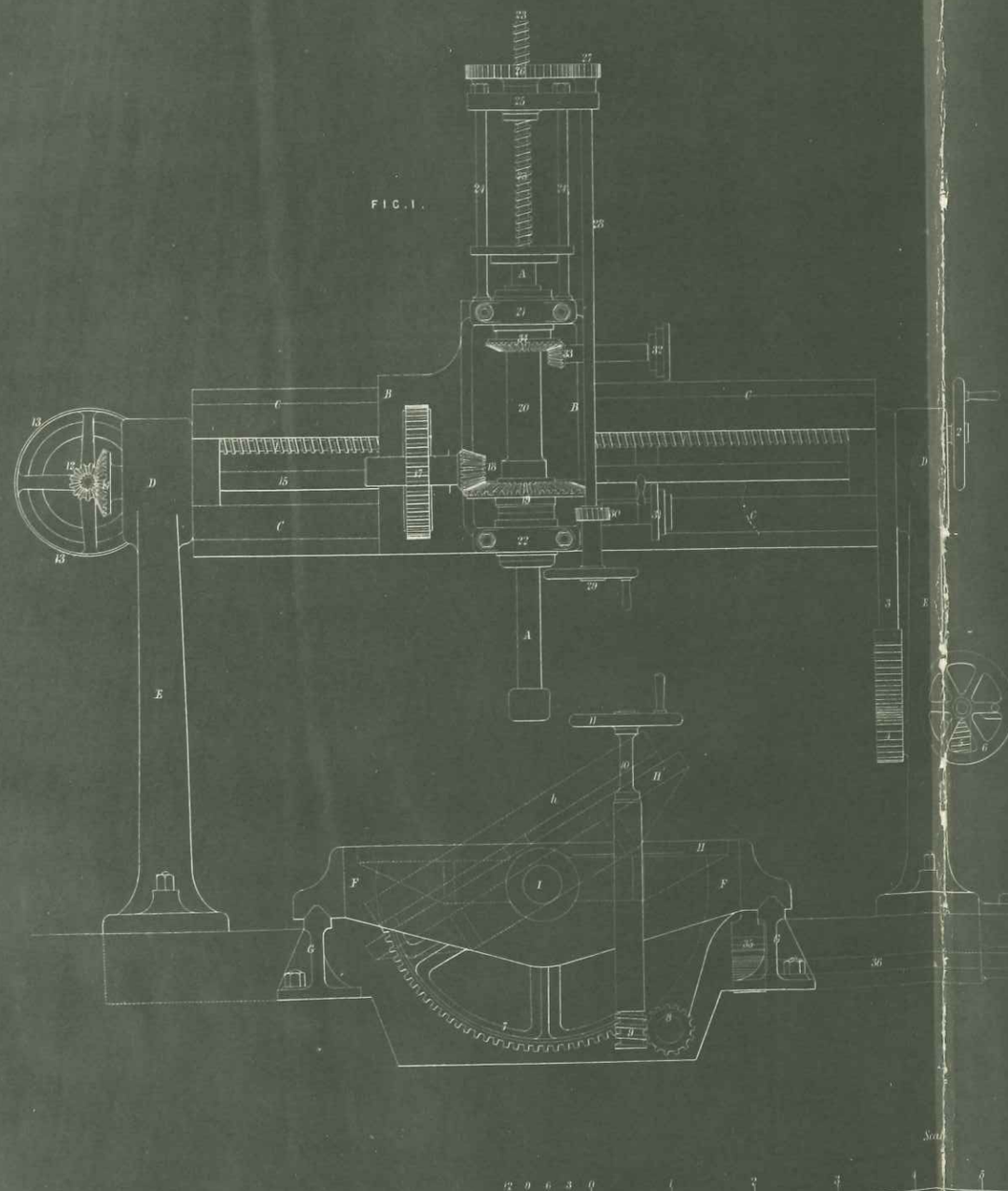
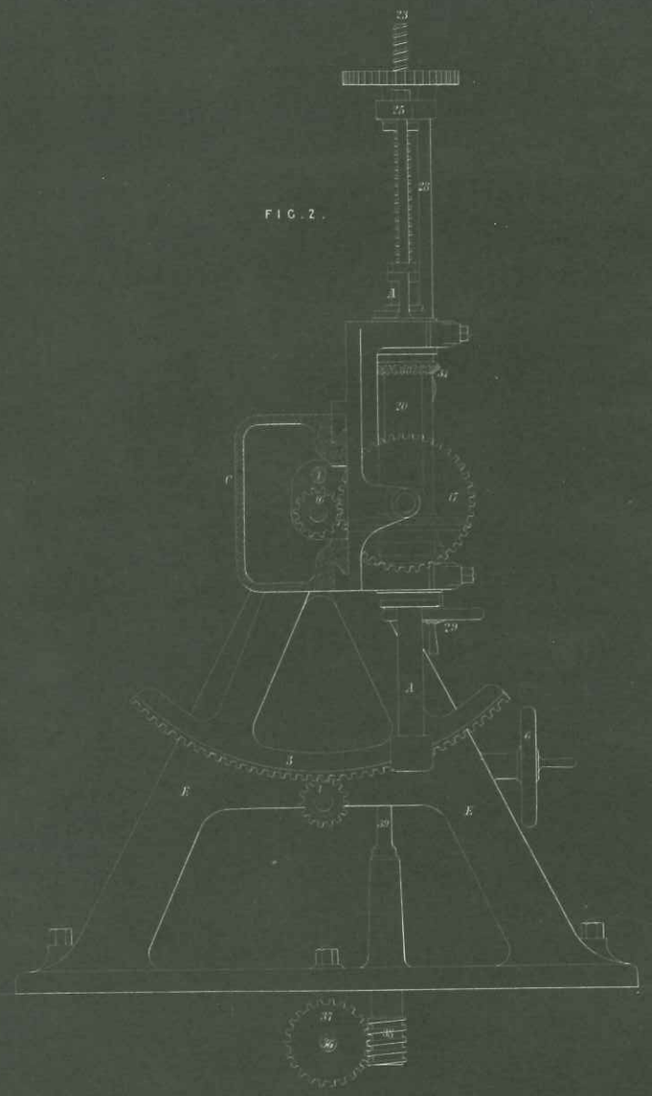


FIG. 2.



The filed drawing is partly colored.

London: Printed by George Edward Eyre and William Spottiswoode,
Printers to the Queen's most Excellent Majesty. 1863.

COPY HEREWITH OR OBTAIN FROM LIBRARY
ALL PAGES
SPECIFICATIONS
DRAWINGS
APPLICATION SERIAL NO.
PATENT NUMBER 2751
CI
SUB.
DATE 1862

A.D. 1862, 13*th* OCTOBER. N° 2751.

Boring Machinery.

LETTERS PATENT to George Harvey and Alexander Harvey, junior, of the Firm of G. and A. Harvey, of Glasgow, in the County of Lanark, North Britain, Engineers, for the Invention of "IMPROVEMENTS IN BORING MACHINERY."

Sealed the 13th April 1863, and dated the 13th October 1862.

PROVISIONAL SPECIFICATION left by the said George Harvey and Alexander Harvey, junior, at the Office of the Commissioners of Patents, with their Petition, on the 13th October 1862.

We, GEORGE HARVEY and ALEXANDER HARVEY, junior, of the Firm of G. and A. Harvey, of Glasgow, in the County of Lanark, North Britain, Engineers, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN BORING MACHINERY," to be as follows:—

This Invention comprises improvements in boring machinery specially designed for boring the various holes required in any either flat or curved war-ship armour plate, and which are also applicable in other cases having like requirements.

In one modification of machinery embodying the improvements the boring spindle and its driving and feeding details are fitted upon a slide or carriage capable of adjustment transversely upon a horizontal guide piece. This horizontal guide piece is formed with journals at the ends fitted to turn in bearings upon standards, and provided with adjusting mechanism, whereby the boring spindle

may be inclined to any convenient degree from the vertical in what may be termed the backward and forward direction. To receive and hold the armour plate there is provided a slide or carriage capable of adjustment backwards or forwards upon horizontal guide rails arranged below the inclinable spindle guide piece, and at right angles thereto. The armour plate or other article is actually fixed upon a table turning in bearings in the frame of the slide or carriage and fitted with adjusting mechanism, whereby the table with the armour plate or other article upon it may be set at any convenient inclination, but in a direction at right angles to the direction in which the boring spindle can be inclined.

In a somewhat modified arrangement, instead of making the plate, carriage, or table adjustable as to its inclination, the boring spindle and its details may be fitted upon its slide in such a way that any convenient inclination can be given to it in a direction at right angles to that in which the guide piece can be inclined. With these arrangements, after the armour plate or other article has been fixed upon its table or carriage, it may with the greatest facility be moved by means of the adjusting mechanism into every position required for boring the holes in it, whatever may be the inclination or direction to be given to the holes within the range of inclination for which the machine is constructed.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said George Harvey and Alexander Harvey, junior, in the Great Seal Patent Office on the 13th April 1863.

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, GEORGE HARVEY and ALEXANDER HARVEY, junior, of the Firm of G. and A. Harvey, of Glasgow, in the County of Lanark, North Britain, Engineers, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Thirteenth day of October, in the year of our Lord One thousand eight hundred and sixty-two, in the twenty-sixth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto us, the said George Harvey and Alexander Harvey, junior, Her special licence that we, the said George Harvey and Alexander Harvey, junior, our executors, administrators, and assigns, or such others as we, the said George Harvey and Alexander Harvey, junior, our executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might

make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN BORING MACHINERY," upon the condition (amongst others) that we, the said George Harvey and Alexander Harvey, junior, our executors or administrators, by an instrument in writing under our, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that we, the said George Harvey and Alexander Harvey, junior, do hereby declare the nature of our said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement in writing, reference being had to the accompanying Drawings, and to the letters and figures marked thereon, that is to say:—

Our said Invention comprises improvements in boring machinery specially designed for boring the various holes required in any either flat or curved war-ship armour plate, and which are also applicable in other cases having like requirements.

And in order that our said Invention and the manner of performing the same may be properly understood, we have hereunto appended a Sheet of explanatory Drawings representing a modification of boring machinery embodying our improvements.

Figure 1 is a front elevation of the machinery, and Figure 2 is a side elevation partly in vertical section. In this modification the boring spindle A and its driving and feeding details are fitted upon a slide or carriage B, capable of adjustment transversely upon a horizontal guide piece C by means of a screw spindle 1 and hand wheel 2. The guide piece C is formed with journals at the ends, fitted to turn in bearings D upon standards E bolted to the foundation, and is provided with adjusting mechanism whereby the boring spindle A may be inclined to any convenient degree from the vertical in what may be termed the backward and forward direction. The adjusting arrangements consist, in this example, of a toothed sector 3 fixed on one end of the guide piece C inside the standard E, and in gear with a pinion 4 on a spindle turning in a bearing formed through the standard. On the other end of the spindle there is a worm wheel 5, which is actuated by a worm on the spindle of a hand wheel 6. To receive and hold the armour plate or other article there is provided a slide or carriage F, capable of adjust-

ment backwards or forwards upon horizontal guide rails G, arranged below and at right angles to the inclinable guide piece C, and strongly bolted to the foundation. To adjust the slide F backwards or forwards there is fixed to it at one side a rack 35, with which there gears a pinion on a horizontal shaft 36 (indicated by dotted lines in Figure 1), and this shaft has fast on its other end a worm wheel 37 actuated by a worm 38 on the lower end of a vertical spindle 39, fitted with a hand wheel 40 at its top end. The armour plate or other article is actually fixed upon a table indicated by dotted lines at H, and formed with journals I to turn in bearings in the frame of the slide or carriage F. This table H is fitted with adjusting mechanism, whereby the armour plate or other article upon it may be set at any convenient inclination, but in a direction at right angles to the direction in which the boring spindle A can be inclined. The adjusting mechanism consists, in this example, of a toothed sector 7 fixed to the table H, and there gears with this sector a pinion on a short spindle 8 carried by the frame F, the spindle 8 having also fast on it a worm wheel actuated by a worm 9 on the lower end of a vertical spindle 10, fitted with a hand wheel 11. With these arrangements, after the armour plate or other article has been fixed upon its table or carriage H, it may with the greatest facility be moved by means of the various adjusting mechanism, herein-before described, into every position required for boring the holes in it, whatever may be the inclination or direction to be given to the holes within the range of inclination for which the machine is constructed. Thus at H^1 the table is, in dotted lines, shown in an inclined position with an armour plate *h* fixed upon it.

The arrangements for driving the drill spindle A may be varied, but those shown in the Drawing are simple and convenient. On a cross shaft 12 there is the usual driving pulley 13, and a bevil pinion on this shaft drives a bevil wheel 14 fast on a horizontal shaft 15 placed in bearings in the journals of the inclinable guide piece C, so as to lie in the axis of this guide piece. Fitted with a groove and feather to this shaft 15 there is a pinion 16, which by flanges on the inside of the slide B is made to accompany this slide, so as to be always in gear with a spur wheel 17 upon a short spindle carried by the slide. On the spindle of the spur wheel 17 there is a bevil pinion 18 in gear with a bevil wheel 19 on the tubular spindle 20, which is mounted in upper and lower bearings 21, 22, on the slide B, and has the drill spindle A passing through it, being driven by a groove and feather, which admits of the requisite longitudinal movement. The drill spindle A is moved or fed downwards by a screw spindle 23, formed with a cross head on its lower end and guided upon a pair of rods 24. A cross head 25 is fixed on the top of the rods 24, and

carries a spur wheel 26, the eye of which is screwed to fit the screw spindle 23, which is in consequence raised or lowered by turning the wheel 26. The spur wheel 26 is turned by a pinion 27 fixed on the top of a spindle 28, carried by the slide, and having a hand wheel 29 on its lower end for adjusting by hand. Self-acting feeding gear is also added, there being on the spindle 28 a worm wheel 30, actuated by a worm on a spindle fitted with stepped pulleys 31, to be driven by a belt from similar pulleys 32 on a spindle carried by the slide and driven by a bevil pinion 33 in gear with a bevil wheel 34 on the tubular spindle 20.

It will be obvious that our improved boring machinery may be modified in various ways as regards the arrangement of its details; thus instead of making the table (H) which receives the armour plate or other article adjustable as to its inclination in the manner described, the boring spindle and its details may be fitted upon its slide (B) in such a way that any convenient inclination can be given to it in a direction at right angles to that in which the guide piece (C) can be inclined. The various adjusting motions may also be modified. The arrangement, however, delineated on the accompanying Sheet of Drawings and herein-before described is what we at present consider to be the most suitable and convenient in practice.

Having thus particularly described our said Invention, and the manner in which the same is or may be performed, we have to state that we do not restrict ourselves to the precise details herein described and delineated, but that what we believe to be novel and original, and claim as the Invention secured to us by the herein-before in part recited Letters Patent, is, the constructing or arranging of boring machinery substantially as herein-before described.

In witness whereof, we, the said George Harvey and Alexander Harvey, junior, have hereunto set our hands and seals, this Eighth day of April, in the year of our Lord One thousand eight hundred and sixty-three.

GEORGE HARVEY. (L.S.)
A. HARVEY, JUN^R. (L.S.)

Witness,
EDMUND HUNT, Patent Agent,
28, St. Enoch Square, Glasgow.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1863.